

**Междисциплинарная конференция**  
**Interdisciplinary Conference**



**АДАПТАЦИОННЫЕ СТРАТЕГИИ ЖИВЫХ СИСТЕМ**

11 - 16 июня, 2012, Новый Свет, Крым, Украина

**ADAPTIVE STRATEGIES OF LIVING SYSTEMS**

June 11 - 16, 2012, Novy Svet, Crimea, Ukraine



## IDENTIFICATION OF FIBER FLAX VARIETIES WITH INSERTION LIS-1, POTENTIALLY ADAPTIVE TO ADVERSE ENVIRONMENTAL CONDITIONS

<sup>1</sup>Melnikova N.V., <sup>1</sup>Bolsheva N.L., <sup>1</sup>Rachinskaya O.A., <sup>1,2</sup>Speranskaya A.S., <sup>1</sup>Yurkevich O.Yu.,  
<sup>1,2</sup>Lakunina V.A., <sup>2</sup>Krinitina A.M., <sup>1</sup>Belenikin M.S., <sup>3</sup>Kishlyan N.V., <sup>1</sup>Zelenin A.V., <sup>1</sup>Muravenko O.V.,  
<sup>1</sup>Kudryavtseva A.V.

<sup>1</sup>Engelhardt Institute of Molecular Biology, Russian Academy of Sciences, Moscow, Russia

<sup>2</sup>Moscow State University, Faculty of Biology, Moscow, Russia

<sup>3</sup>All-Russian Research Institute for Flax, Russian Academy of Agriculture, Torzhok, Russia  
e-mail: mnv-4529264@yandex.ru

The flax (*Linum usitatissimum* L.) is one of the most important technical crops. Due to unique genome plasticity, flax is a convenient object for studying the regulatory mechanisms of adaptation to environmental stressors, genetic diversity, and genome evolution in plants. Heritable genome alterations have been shown to occur in some flax varieties during adaptation to certain stress factors, such as insufficient or excess nutrient conditions, drought, or high temperatures. The plants with such inherited changes were termed genotrophs (Durrant, 1962; Evans et al., 1966). The formation of genotrophs resistant to a low soil nutrient content and/or drought is associated with appearance of insertion LIS-1 at a specific site of the plant genome (Chen et al., 2005). Although the induction mechanisms and functions of insertion LIS-1 are still insufficiently studied, this sequence represents one of the most efficient molecular markers for finding the flax varieties with high genome plasticity and adaptation capacities.

In this research, 42 fiber flax varieties grown at All-Russian Research Institute for Flax of the Russian Academy of Agriculture under field conditions in 2011 were screened for enhanced abilities to adapt to abiotic stressors. The genome DNA isolated from flax leaves was tested for the presence of insertion LIS-1 using PCR with primer pairs GGGTTTCAGAACTGTAACGAA and GAGGATGGAAGATGAAGAAGG; GGGTTTCAGAACTGTAACGAA and GCTTGGATTAGACTTGGCAAC (Chen et al., 2009), which detected the presence or absence of the insertion, respectively. The results were assessed using agarose gel electrophoresis (figure). The LIS-1 sequence was found in 14 varieties of fiber flax: Diplomat, Lada, Lenok, Tost 3, Mogilevskii 2, Priboi, Smolich, A29, Marilyn, TMR 1919, Glazovskii Kryazh, G1071/4, Liral Prince, and Stormont Cirrus. The varieties with insertion LIS-1 deserve special attention in further studies of flax adaptation to adverse environmental factors and in breeding of new resistant varieties.

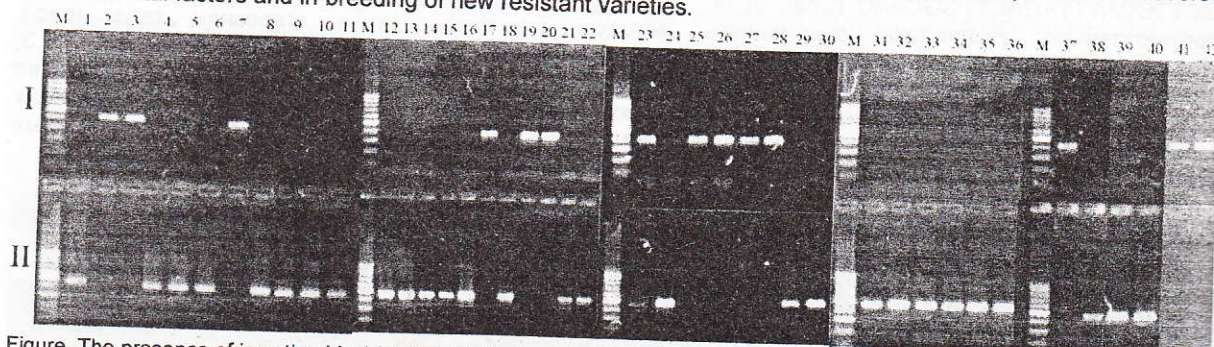


Figure. The presence of insertion Lis-1 in different flax varieties. I PCR with primers detecting the presence of Lis-1; II PCR with primers detecting the absence of Lis-1. Varieties on lanes: 1 - Novatorskii, 2 - TMR 1919, 3 - Glazovskii Kryazh, 4 - 1147, 5 - Svetoch, 6 - Nike, 7 - Liral Prince, 8 - 4v-29, 9 - Aleksim, 10 - Lira, 11 - Okean, 12 - Alfa, 13 - Gorizont, 14 - Lavina, 15 - Zaryanka, 16 - Vasilek, 17 - Priboi, 18 - Tost 4, 19 - Diplomat, 20 - Lada, 21 - Slavnyi, 22 - Tverskoi, 23 - Lenok, 24 - A-93, 25 - Tost 3, 26 - Mogilevskii 2, 27 - Smolich, 28 - A29, 29 - Ante, 30 - Rusich, 31 - Orshanskii, 32 - K6, 33 - Viksoil V-2, 34 - Donskoi 95, 35 - Ford, 36 - Tomskii 16, 37 - Marilyn, 38 - Smolenskii, 39 - Ki-5, 40 - LM-98, 41 - Stormont Cirrus, 42 - G 1071/4. M - 100 bp marker.

The work was financially supported by grants MK-6205.2012.4, RFBR 10-04-01212, RFBR 12-04-01469-a and RFBR 11-08-00716

### References

1. Durrant A. (1962). The environmental induction of heritable change in *Linum*. *Heredity*. 17: 27-61.
2. Evans G.M., Durrant A., Rees H. (1966). Associated nuclear changes in the induction of flax genotrophs. *Nature*. 212: 697-699.
3. Chen Y, Schneeberger R.G., Cullis C.A. (2005). A site-specific insertion sequence in flax genotrophs induced by environment. *New Phytol*. 167: 171-180.
4. Chen Y., Lowenfeld R., Cullis C.A. (2009) An environmentally induced adaptive (?) insertion event in flax. *Int. J. Genet. Mol. Biol.* 1(3): 38-47.